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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/807,119	03/24/2004	Yoshiki Igarashi	250507US-2 DIV	3681
22850	7590	09/29/2005	EXAMINER	
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			HOANG, QUOC DINH	
			ART UNIT	PAPER NUMBER
			2818	

DATE MAILED: 09/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/807,119	Applicant(s) IGARASHI ET AL. 	
	Examiner Quoc D. Hoang	Art Unit 2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 July 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 18-44 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 18-44 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. Amendment filed on 7/19/2005 has been entered and made of record as Paper No. 07-2005. Claims 18-44 are pending in the application.

Applicants' remarks have been considered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 18-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al (U.S. Pat No. 6,451,703) ("Liu") or Hung et al (U.S. Pat No. 6,387,287) ("Hung") in view of Lenz et al (U.S. Pat No. 5,534,751) ("Lenz").

Liu or Hung teaches an oxide film etching apparatus. A process chamber may be provided which is configured to maintain a vacuum environment. An upper electrode and a lower electrode may be included. A target object having an oxide film may be held on an upper surface on the lower electrode in the process chamber. An etching gas may be introduced into the process chamber to generate a plasma to perform etching the oxide film. The etching gas including a C₄F₆ gas and an O₂ gas with various ratio of C₄F₆ gas to O₂ gas may be used. Liu (col. 5, line 25 through col. 12, line 35 and Fig. 2) or Hung (Fig. 2) teaches that HDP reactors may be used for said oxide etching.

Liu or Hung teaches power supply circuitry configured to supply power to the lower electrode to generate a high frequency field, but does not teach power supply circuitry configured to supply power at different frequencies to the upper electrode and to the lower electrode.

However, Lenz teaches a plasma etching apparatus. Lenz teaches power supply circuitry configured 24 (25-30 MHz) and 23 (1.5-2.5 MHz) to supply power at different frequencies to the upper electrode 14 and to the lower electrode 13 (col. 4, line 48 through col.6, line 8 and Fig. 1). At the time of the invention was made, it would have been obvious to a person of ordinary skill in the art to combine the different frequencies to the upper electrode and to the lower electrode teaching of Lenz with Liu or Hung's oxide etching apparatus, because it would have controlled of the etch parameters and etch selectivity as taught by Lenz, column 1, lines 54-63. Also see Arai et al (US 6,110,287) in the record as evidences for different frequencies plasma processing apparatus.

The above cited claims differ from the prior art by specifying well-known features to the art of semiconductor device fabrication and using various compositions (such as ratio of etchants), processing parameters (such as different flow rate of the etching gas; temperature; frequency). However, they are commonly determined by routine experiment. The process of conducting routine optimizations so as to produce an expected result is obvious to one of ordinary skill in the art. In the absence of showing criticality or new, unexpected results, which is different in kind and not merely in degree from the results of the prior art, it is the examiner's position that a person having

ordinary skill in the art at the time of the claimed invention would have found it obvious to modify Liu, Hung, Lenz or Arai by performing routine experiments (by using various compositions and different processing parameters) to obtain optimal result and adding any of same well-known features to same in order to provide their art recognized advantages and produce an expected result. See evidences in the record of process parameters in dry / plasma etching and frequencies as routine experimentation including Welch (US 4,753,709), col. 6, lines 5-8. Flamm (US 4,918,031), col. 7, lines 28-31 . Weling (US 5,522,957), abstract and col. 7, lines 26-32. O'Neill (US 5,683,538), col. 1, lines 40-53. Hung (US 6,174,451), col. 11, lines 43-44; Guinn (US 5,877,032), col.4, lines 3-6, Sekine (US 4,786,361, Figures) and Arai (US 6,110,287), third embodiment and Fig. 18).

Changes in compositions, temperature, concentrations, or other process conditions of a process do not impart patentability unless the recited ranges are critical (i.e., they produce a new and unexpected result that differs in kind and not merely in degree from the result of the prior art). In re Woodruff, 16USPQ2d 1934,1936 (Fed. Cir.1990); In re Hoeschele, 406 F.2d 1403, 160 USPQ 809; In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claims 26, 35 and 44, it would have been obvious to one with ordinary skill in the art to obtain the desired etching selectivity as process parameters are optimized because the same materials are used with the same process steps, it appears that the modified Liu or Hung would inherently contain the same properties and functions as claimed.

Response to Arguments

4. Applicant's arguments filed 7/19/2005 have been fully considered but they are not persuasive.

In response to applicant's argument that Liu does not appear to teach the Claim 18 required ratio of C₄F₆ gas to the O₂ gas within a range between 0.7 to 1.1. The examiner disagrees. Clearly in column 8 lines 60-67 and Tables. 1-4, Liu teaches that the etching gas including a C₄F₆ gas and an O₂ gas with various ratio of C₄F₆ gas and an O₂ gas may be used (e.g., the ratio of about 1.16 in table 3). Although Liu's C₄F₆/O₂ ratio is not in the claimed range (0.7 to 1.1), the claimed invention would have found it obvious to modify Liu, Hung, Lenz since it has been held that where the general conditions of a claim are disclosed on the prior art, discovering the optimum or working ranges involves only routine skill in the art.

In response to applicant's argument (regarding claim 27) that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, it would have been obvious to a person of ordinary skill in the art at the time of the invention was made to combine the different frequencies to the upper electrode and to the lower electrode teaching of Lenz with Liu or Hung's oxide etching apparatus,

because it would have controlled of the etch parameters and etch selectivity as taught by Lenz, column 1, lines 54-63.

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Allen (US 5,970,373, col. 8, lines 30-40) and Ko (US 6,432,833, Fig. 4) show typical HDP reactors for plasma etching application. The ratios of the oxidizing gas (oxygen) and the etchant gas for the etching selectivity in Welch (US 4,753,709), col. 6, lines 5-8. Flamm (US 4,918,031), col. 7, lines 28-31. Weling (US 5,522,957), abstract and col. 7, lines 26-32. O'Neill (US 5,683,538), col. 1, lines 40-53. Hung (US 6,174,451) teaches that the process parameters may vary and dependent on different commercially available plasma reactors (col. 11, lines 43-44). Guinn (US 5,877,032, col. 4, lines 3-6) shows that process parameters (e.g.,

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temperature, flow rate, pressure, RF bias, source power, oxygen clean time) are varied to change the etch rate of photoresist and /or the contact hole. Sekine (US 4,786,361; Figures) shows that etching rate is a function of flow rate and pressure. Arai (US 6,110,287), third embodiment and Fig. 18) shows that different frequencies between upper electrode and lower electrode.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Quoc Hoang whose telephone number is (571) 272-1780. The examiner can normally be reached on Monday-Friday from 8.00 AM to 5.00 PM.

If attempt to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on (571) 272-1787. The fax phone numbers of the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 872-9306 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Quoc Hoang 
Patent examiner/AU 2818


David Nelms
Supervisory Patent Examiner
Technology Center 2800